Sohag University
Faculty of Engineering
Electrical Engineering Dept

Automatic control
Mid-term Exam 2018-2019
Allowed time: (2h)


Answer All the Following Questions [30 Marks]

Q1) a) The figure below shows a block diagram of a space vehicle attitude control system where R and Y are the Laplace transforms of the reference (or desired) and actual attitude angles respectively. Determine the values of K_P and K_D to yield a settling time of 0.5 second and 20% overshoot in the closed-loop system for a unit-step input. **[5 Marks]**
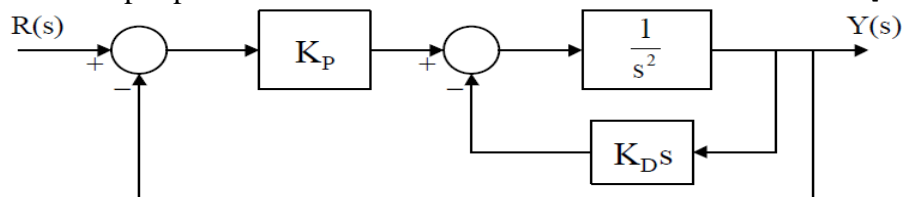

b) Determine the step, ramp, and parabolic error constants of the following unity-feedback control system. **[5 Marks]**

$$G(s) = \frac{K(1 + 2s)(1 + 4s)}{s^2(s^2 + s + 1)}$$

Q2) a) The block diagram of a motor-control system with tachometer feedback is shown in the following figure. Find the range of values of K_t so that the system is stable. Determine the critical value K_{tc} of K_t and the frequency of sustained oscillation in this case. **[5 Marks]**
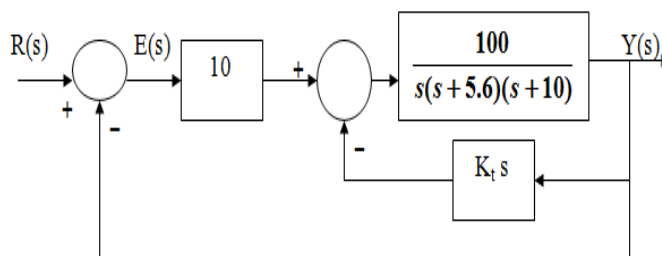
b) Using Mason's rule, find the transfer function, T(s) = Y(s) / R(s), for the system represented in the following Figure. **[5 Marks]**
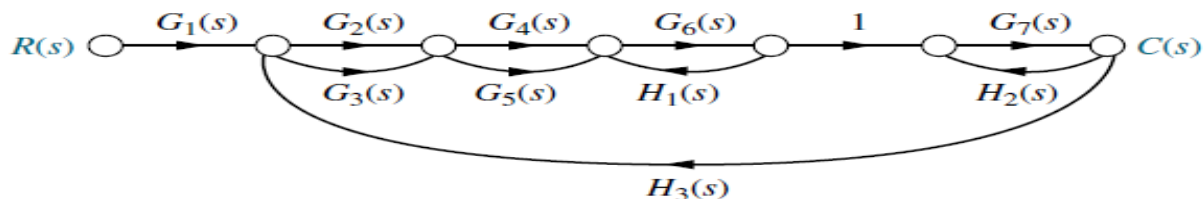
Q3) Sketch the root loci for the system shown in the following Figure. **[10 Marks]**

With our Best wishes